

Greetings and welcome to the **MARCH 2016** edition of the WDFW Climate News Digest. The purpose of this newsletter is to provide highlights of relevant climate change news, events and resources for WDFW staff. Feedback or suggestions for items to include in future editions are appreciated – many *thanks* to those who have sent links and references and please keep them coming.

Thanks for contributions this month from Bob Vadas, Bruce Botka, Teresa Scott and Jay Krientz. Other sources for news include: Point Blue Conservation Science, NPLCC Climate Science Digest, DNR eMission Control Newsletter, Climate.gov, NOAA Climate Newsletter, and “BioClimate”, the newsletter of the USGS Climate Science Centers. Contact Lynn to subscribe directly to any of these.

WHAT’S HAPPENING AT WDFW?

Washington Team Awarded Grant to Build Community Resilience to Coastal Hazards

The National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management awarded Washington Sea Grant \$879,255 for a three-year project to assist coastal communities in Washington State facing significant risk from the impacts of sea level rise, storm surge and shoreline erosion. With 3,300 miles of coastline and more than 45 coastal cities, Washington needs to prepare people, infrastructure, and fish and wildlife habitat for these hazards, which are forecast to worsen over time. The Estuary and Salmon Restoration Program (ESRP), managed by WDFW is excited to be part of this Washington team. These funds will support ESRP Learning Projects analyzing bluffline erosion rates and beach restoration strategies in Puget Sound and leveraging existing capital funding for important nearshore projects. Other Washington project partners include Washington State Department of Ecology’s Coastal Zone Management Program, Climate Impacts Group and other UW departments, U.S. Geological Survey, Island County Department of Natural Resources, City of Tacoma, Western Washington University and The Nature Conservancy. For more information, contact Jay Krientz, Estuary and Salmon Restoration Program Manager.

CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

The Northwest Climate Science Center Story Map Project

The Northwest Climate Science Center (NW CSC) works to provide climate data products that meet stakeholder needs. The NW CSC recently announced its latest data delivery tool: the NW CSC Story Map. This online, interactive tool enables us to share key messages, maps, and datasets from NW CSC-funded projects. Through the Story Map, users can explore, interact with, and access data on a number of climate change-related topics, such as sea-level rise, loss of mountain snowpack, and the vulnerability of spotted owl, sage-grouse, bull trout, and whitebark pine to climate change. Visit the NW CSC’s website, www.nwclimatescience.org, to access the Story Map, and please feel free to send comments or suggestions on ways to improve this tool.

King County-Cities Climate Collaboration wins 2016 EPA Climate Leadership Award

In 2011, King County, Washington and nine cities founded the King County-Cities Climate Collaboration (K4C) in recognition that neighboring local governments can achieve greater action on climate solutions by working together. Since its inception, K4C has grown to 14 member jurisdictions, representing 75 percent of the county’s 2 million residents.

The King County-Cities Climate Collaboration is being recognized for a Climate Leadership Award—for the following accomplishments:

- Supporting development and adoption of a countywide GHG emissions reduction goal of 25 percent by 2020, 50 percent by 2030, and 80 percent by 2050 (2007 baseline).

- Developing Principles of Collaboration and the Joint County-City Climate Commitments, which address reducing emissions, addressing energy supply, green building, land use, forests, and more. The plans outline a comprehensive shared vision and policy framework for confronting climate change.
- Commissioning a technical study that depicted countywide sources and uses of energy and emissions and what actions are necessary to achieve its GHG reduction goals. The analysis resulted in setting a goal of reducing energy use in all existing buildings by 25 percent by 2030, among other targets. The partnership has resulted in municipal policy and code changes, joint grant funding, and increased influence among other stakeholders
- Exploring the potential to partner with local utilities and businesses to jointly invest in and develop a large-scale renewable energy project, such as wind or solar.

RESOURCES

Time of Emergence tool - when could climate change matter across the Pacific Northwest?

This tool, developed by US EPA Region 10, the Corps and the UW Climate Impacts Group was designed to help users explore the basic question: when and where could climate change matter across the Pacific Northwest? This is a new approach to delivery of climate change information that focuses on identifying the time when climate change causes local conditions to deviate significantly from the past, which can be called the “time of emergence of climate change”. This tool presents the results of Time of Emergence analysis for 35 climatic variables during different times of the year, for counties, watersheds and major rivers of the Pacific Northwest. These results, combined with information on local sensitivities, design standards or critical thresholds, and the effort need to prepare for change, can be used to help prioritize decisions about when, where and for which climate change impacts preparatory actions are most urgent. This prototype tool remains in development, but CIG encourages users to [test the tool](#) and provide feedback.

Predicted Impacts of Climate Change on Groundwater Resources of Washington State

This report summarizes findings from an evaluation of how global climate change may impact groundwater resources in Washington State in the coming decades. Recent scientific literature was reviewed and synthesized to support the evaluation. Based on this analysis, recommendations are presented to help our state prepare for, and adapt to, the climate-related changes that are predicted for groundwater. Although out of sight, groundwater is a highly valuable natural resource for Washington’s citizens, economy, and environment. Throughout the state, groundwater provides a major source of water supply, sustains streamflows and wetland functions during biologically critical periods of the year, and helps to buffer the impact of short-term droughts. The primary concern identified during this evaluation is the potential for a climate-driven increase in groundwater pumping in Washington State. If a substantial increase in the net volume of groundwater withdrawal is used to address water supply shortages associated with climate change, there are likely to be strong and undesirable effects on groundwater storage, baseflow discharge, groundwater-dependent aquatic ecosystems, and coastal aquifer water quality.

CarbonScapes: A national look at carbon landscapes

A quick assessment of where current carbon stocks in the United States are higher and where they are lower can help guide wise decision making about land use and management, encouraging practices that favor carbon storage in soils and plants. This website provides useful and easy-to-navigate web mapping applications and other resources to educate and answer questions about the U.S. Department of Agriculture (USDA) inventory, modeling, and mapping of terrestrial biosphere carbon across the United States. CarbonScapes was developed through a collaboration between the USDA and West Virginia University.

USGS “Climate Matters” Newsletter Highlights Climate R&D Program

“Climate Matters” is a newsletter highlighting work from the U.S. Geological Survey Climate Research and Development Program. The Winter 2016 issue of Climate Matters highlights USGS research on patterns and impacts of drought on ecosystems of the western United States, the effects of oil and gas development on landscapes, and the processes that influence coastal wetlands. [Read More >>](#)

A Summary of Climate Funding Opportunities

Every year, the National Oceanic and Atmospheric Administration (NOAA) compiles a summary of climate-related funding opportunities. This document provides a snapshot of what is currently available (as of January 15, 2016) across the country and across numerous government agencies and non-governmental organizations. The document is posted on The Nature Conservancy's Collaboratory for Adaptation to Climate Change website. [Read More >>](#)

How much warmer was your city in 2015? (from the New York Times)

Scientists declared that 2015 was Earth's hottest year on record. In a database of 3,116 cities provided by AccuWeather, about 90 percent of them were warmer than normal. Enter your city in the field provided on the web page to see how much warmer it was last year.

Of Rivulets and Roads: Improving Transportation Safety and Habitat of Road/Stream Crossings

In January, the Upper Midwest and Great Lakes & North Atlantic LCCs convened the [Aquatic Habitat Connectivity and Infrastructure Resilience Workshop](#) to bring together natural resource and transportation infrastructure agencies to better design and deliver safe and environmentally sound stream crossings. Read the [full story](#) about this unique partnership.

Assessing Coastal Manager Science Needs and Disseminating Science Results for Planning

USGS recently announced the final report "[Assessing coastal manager science needs and disseminating science results for planning](#)" which summarizes results from 6 sea-level rise science delivery workshops held last winter funded by the California and North Pacific LCCs. This effort highlights the importance of close manager-scientist partnerships. The report contains valuable lessons learned on methods of delivering climate science and perspectives of a diverse management audience on climate science. [Click here](#) to view materials from the workshops or learn more about this sea-level rise research along the Pacific coast.

NIDIS Launches Drought Early Warning System Networks

NIDIS launched two new Drought Early Warning Systems (DEWS) in the Pacific Northwest and in the Midwest at meetings in early February. The launch meetings brought together federal, tribal, state, local, and academic partners and stakeholders for an in-depth examination of drought in each region, centered on improving the capacity to meet the early warning information needs of decision makers. [Learn About the Pacific Northwest DEWS »](#)

Watch all of 2015's weather in a time lapse video from Scientific American

The new visualization uses geostationary satellite data from EUMETSAT, the Japan Meteorological Agency and the National Oceanic and Atmospheric Administration to stitch together 365 days of data into one stunning highlight reel of 2015's weather.

LEARNING OPPORTUNITIES

March 23rd, 9:00 (Pacific), webinar, “Ecosystem and Fishery Impacts of Rapid Warming in the Gulf of Maine” - more information [here](#).

April 6th, 12:30 pm (Pacific), webinar, “Patterns, Causes and Consequences of Spring Onset Timing Variations and Trends in the U.S.” - more information [here](#).

Recorded Webinar - How Identifying Climate Refugia can help to Prioritize conservation

This presentation summarizes the physical processes that create climate refugia, discusses a new framework for locating and managing them, and uses examples to illustrate ways to identify and verify climate refugia.

2015 Northwest Climate Conference – videos now available [here](#)

These videos are also linked from the web version of the conference program: <http://pnwclimateconference.org>. The 2016 Northwest Climate Conference is being planned for this fall in Oregon – details to be posted in this newsletter as they are available.

CLIMATE SCIENCE NEWS

How is spring unfolding this year?

The Extended Spring Index models are a powerful way to track the progression of spring across the continent. This year, we are applying these models to gridded temperature data to map the start of spring, as represented by these models, on a fine scale.

January 2016: Earth still on a hot streak *(from Climate.gov)*

January 2016 became the ninth month in a row to set a new record-warmest monthly temperature. The globally averaged temperature across land and ocean surfaces was 1.87°F above the 20th century average, the highest for January in the 137-year period of record, breaking the previous record of 2007 by 0.29°F. January 2016 also marks the 14th consecutive month (since December 2014) that the monthly global temperature ranked among the three warmest for its respective month.

Office of the Washington State Climatologist March newsletter

Topics include: February climate summary including some Dec-Feb (winter) stats, a note on a historic bird mortality event on the coast, snowpack and drought update, temperature and precipitation outlook.

SPECIES AND HABITATS

Small Coho run of 2015 blamed on warm ocean *[from the Seattle Times]*

The Skagit River coho run of 2015 ranked as the worst on record, and those that did make it back to freshwater spawning grounds were undersized - Scientists say that “[the blob](#)” — a vast expanse of abnormally warm coastal waters — was the most likely suspect in the poor show of fish because it reduced the food supplies for coho that primarily forage in the coastal waters.

Altitudinal shifts of the native and introduced flora of California in the context of 20th-century warming *[from Wiley On-line]*

[from the abstract] “The differential responses of plant species to climate change are of great interest for scientists and conservationists. One underexploited resource for better understanding these changes are the records held by herbaria. Using these records to assess the responses of different groups of species

across the entire flora of California, we sought to quantify the magnitude of species elevational shifts, to measure differences in shifts among functional groups and between native and introduced species, and to evaluate whether these shifts were related to the conservation of thermal niches. Our analyses suggest that introduced species have disproportionately expanded their ranges upward in elevation over the past century when compared with native species. While these shifts in introduced species may not be exclusively driven by climate, they highlight the importance of considering the interacting factors of climate-driven range shifts and invasion to understand how floras are responding in the face of anthropogenic change.

Ecological Drought in Alaska: Understanding the Impacts of Climate Change on a Large, Diverse, Remote Landscape

Climate change is threatening Alaska's landscape and its water resources. The state is getting warmer earlier in the year, burning more and more often, and getting less snow. Last fall, twenty-one scientists, managers, and communicators gathered in Fairbanks, AK to discuss and synthesize our existing knowledge of climate change and ecological drought impacts across the state. [Read More >>](#)

Projecting the Hydrologic Impacts of Climate Change on Montane Wetlands (attached) [from PLOS ONE]

Montane wetland ecosystems are expected to be among the most sensitive to changing climate, as their persistence depends on factors directly influenced by climate (e.g. precipitation, snowpack, evaporation). Despite their importance and climate sensitivity, wetlands tend to be understudied due to a lack of tools and data relative to what is available for other ecosystem types. Here, we develop and demonstrate a new method for projecting climate-induced hydrologic changes in montane wetlands.

Amphibians in the climate vise: loss and restoration of resilience of montane wetland ecosystems in the western US (attached) [from the University of Washington] Findings in this study include the following:

- Introduced fish (mostly trout and other salmonids) exclude amphibians and other species from large "climate-resistant" ponds and lakes in mountainous areas of the west
- Shallow fish-free wetlands used by native species are disproportionately vulnerable to climate-induced drying;
- Interactions between climate change and introduced fish are an underappreciated source of native biodiversity loss in wetlands;
- Targeted fish removals offer a proactive approach for restoring wetland ecosystem resilience to climate change in regions at high risk for extinctions; and
- Newly developed wetland modeling tools can improve climate adaptation action plans that help ecosystems maintain local and regional resilience in the face of a changing climate.

Impacts of climate change on dairy production [from the UW Climate Impacts Group]

Climate change is likely to affect milk production because of the sensitivity of dairy cows to excessive temperature and humidity. We use downscaled climate data and county-level dairy industry data to estimate milk production losses for Holstein dairy cows in the conterminous United States. On a national level, we estimate present-day production losses of 1.9 percent relative to baseline production and project that climate impacts could increase these losses to 6.3 percent by the end of the twenty-first century.

A Climate Change Vulnerability Assessment of California's Terrestrial Vegetation [from the California LCC]

California Department of Fish & Wildlife and UC Davis recently completed "[A Climate Change Vulnerability Assessment of California's Terrestrial Vegetation](#)". This report assesses 29 natural vegetation types in California across four alternate projected climates by the end of the century. Stay tuned for access to the data generated by this project to be available on the Climate Commons soon!

POLICY AND MANAGEMENT - MITIGATION AND ADAPTATION

Paris Climate Deal: Key Points at a Glance *(from The Guardian, via NPLCC)*

This article from the Guardian explains the key details from the Paris climate deal. Governments agreed to limit global warming to 1.5C above pre-industrial levels. All countries have agreed to attain net zero emissions between 2050 and 2100. Of those countries, 187 have put forth plans for how to accomplish this. The deal also contains a mechanism that reviews countries' progresses and makes a "global stocktake" every five years. Another key point in the deal is a mechanism for addressing financial losses that vulnerable countries face due to climate change, as well as funding to help developing countries adapt and transition to clean energy.

Adapting Sustainable Forest Management to Climate Change: A Systematic Approach for Exploring Organizational Readiness in Canada

Any organization planning to proactively manage for climate change effects needs a game plan. A crucial first step is to identify the strengths and capabilities, along with weaknesses and gaps, that will affect the organization's readiness to respond to the challenges of climate change. Given that Canada is an ecologically diverse, multijurisdictional country, a single prescriptive approach to evaluating organizational readiness to address climate change is impossible. This report describes a systematic approach that practitioners can use to develop and answer a specific suite of questions that will in turn help them to assess their respective organizations' readiness to adapt to the effects of climate change. [Read more.](#)

California Climate Investment Map

California's climate law - AB 32, passed in 2006 with bipartisan support - set the goal of reducing greenhouse gas emissions to 1990 levels by 2020. The [California Climate Investment Map](#) illustrates growing investments by state programs in clean energy, clean transportation, wetland restoration, and other efforts towards greenhouse gas reduction.

First-Ever International Carbon Emissions Standards for Commercial Aviation

The United States and 22 other countries reached an agreement on the first [global carbon standards](#) for commercial aircraft at an International Civil Aviation Organization (ICAO) meeting in Montreal. When fully implemented, the standards are expected to reduce carbon emissions by more than 650 million tons between 2020 and 2040, equivalent to removing more than 140 million cars from the road for a year.